

2003 STATE OF THE PAVEMENT

Based on the

2003 PAVEMENT CONDITION SURVEY



STATE OF CALIFORNIA
Department of Transportation
Division of Maintenance

California
State of the Pavement Report, 2003



California Department of Transportation
Division of Maintenance
September 2004

Acknowledgment

This report is prepared by the California Department of Transportation, Division of Maintenance, Offices of Roadway Rehabilitation and Roadway Maintenance to summarize the 2003 pavement condition and expenditures on the State highway system for Department management and others.

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Technical assistance and printing provided by Administration, Division of Business, Facilities and Asset Management, Reprographics Unit. Intranet and Internet conversion by Jim Varney, Division of Maintenance.

The completed 2003 PCR can be downloaded from the Roadway Maintenance intranet page:
<http://onramp.dot.ca.gov/hq/maint/roadway/index.htm>

For useful data and mapping relating to Maintenance and pavement rehabilitation, please visit:
URL: http://onramp.dot.ca.gov/hq/maint/roadway_rehab/gis/index.htm

Information about the Pavement Management System is available from:

California Department of Transportation, Division of Maintenance, Office of Roadway Rehabilitation, Pavement Management Information Branch, 1120 'N' Street, Room 3100, MS-31, Sacramento, CA, 95814, telephone (916) 654-2355 or Calnet 464-2355.

Copies of this report may be obtained from:

URL: http://www.dot.ca.gov/hq/maint/2003_SOP.pdf

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California

State of the Pavement Report, 2003

Highway Condition and Needs

The California Department of Transportation (the Department) is responsible for maintaining the State highway system. The State highway system has close to 15,000 centerline miles and over 49,000 lane-miles.

To effectively manage this pavement, the Department conducts an annual Pavement Condition Survey (PCS). A pavement rater crew conducts visual inspections of the pavement surface. In addition, a 'profile' van measures the ride quality via lasers. Using the PCS data, the Pavement Management System (PMS) provides a detailed pavement inventory, identifies project needs, prioritizes pavement distress, and summarizes the condition of the system. The original PMS was developed in the mid 1970s and an update to the PMS is under development.

The 2003 PCS began in March 2003 and was completed in December 2003. The PCS identified 11,824 lane-miles of distressed pavement with ride quality or structural deficiencies (pavement which requires major maintenance or rehabilitation work). This is 4% higher than the 11,356 distress lane-miles reported in the 2002 survey. Almost one of every four lane-miles of California's highways needs repair. Most of the rehabilitation needs are on the non-National Highway System. These are multi-lane divided highways and rural two-lane highways.

TABLE 1 Pavement Deficiency Classification

Deficiency	2002			2003		
	Lane Miles	Percent of Deficiency	Percent of System	Lane Miles	Percent of Deficiency	Percent of System
Major Structural Deficiency	7,670	68%	16%	8,938	76%	18%
Minor Structural Deficiency	2,976	26%	6%	2,410	20%	5%
Poor Ride Quality (Only)	710	6%	1%	476	4%	1%
Totals	11,356	100%	23%	11,824	100%	24%
Total System Lane Miles	49,249*			49,318*		
<i>* Excludes bridge miles</i>						

Vehicle-Miles Traveled on Rough Pavements

According to the National Quality Initiative Steering Committee's National Highway User Survey of May 1996, ride quality is a primary indicator of customer satisfaction. Pavement "smoothness" is measured using a standardized scale, called the International Ride Index (IRI). This is a commonly used performance measure for pavement surfaces throughout the United States. The IRI measures a vehicle's up and down movement over the pavement in inches per one mile of driving. On a smooth road, such as a recently completed pavement project, the up and down movements are low (less than 75 inches per mile). A rough road has an IRI value of over 175 inches per mile. The typical ride quality scale used by the Department is shown below.

Excellent	IRI 0 – 75
Good	IRI 76 – 125
Fair	IRI 126 – 175
Poor	IRI 176 – 200
Unacceptable	IRI 200+

This performance indicator can be used to determine the investment needed to improve the pavement ride quality on the State highway system and is reported in the Department's State Highway System Performance Measures.

Chart 1
Traffic on Rough Pavement, 1999-2003

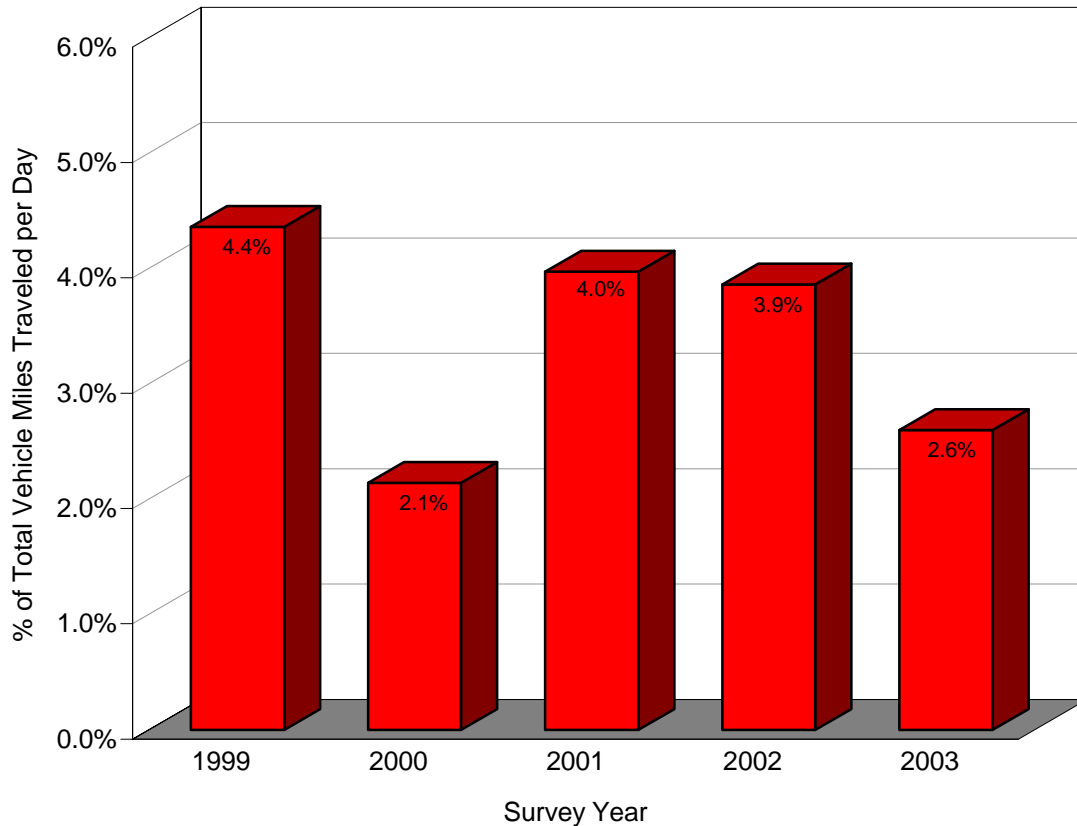


Chart 1 shows travel on rough-riding pavement (pavement with an “Unacceptable” IRI) decreased from 3.9% to 2.6% of the total vehicle-miles traveled per day in 2003. Travel on rough-riding pavement is a small percentage of the overall vehicle-miles traveled. California has nearly 461 million vehicle-miles traveled per day. This number is nine million more vehicle-miles traveled per day than last year. Also, the 2003 survey shows the number of lane-miles with a poor ride quality decreased from the 2002 survey (see Table B, page 19).

Costs, Expenditures and Funding

In the 2002/03 Fiscal Year (FY), \$241 million of rehabilitation and maintenance contracts were awarded. Of this amount, \$188 million was for Roadway Rehabilitation projects that repaired 658 lane-miles of pavement. The Major Maintenance projects totaled \$53 million. These Major Maintenance projects repaired 1,747 lane-miles of roadway and replaced 1,196 concrete slabs.

Due to budget shortfalls in the last two years, the dollars spent on rehabilitation and maintenance projects were significantly reduced. In the 2000/01 FY, \$856 million of contracts were awarded for Roadway Rehabilitation projects. However, in the 2001/02 FY the funds decreased to \$262 million and in the 2002/03 FY the amount was \$188 million. The same was true for the Major Maintenance program. In prior years, the program was approximately \$100 million. In the 2001/02 FY, \$63 million of contracts were awarded and in the 2002/03 FY the amount was \$53 million.

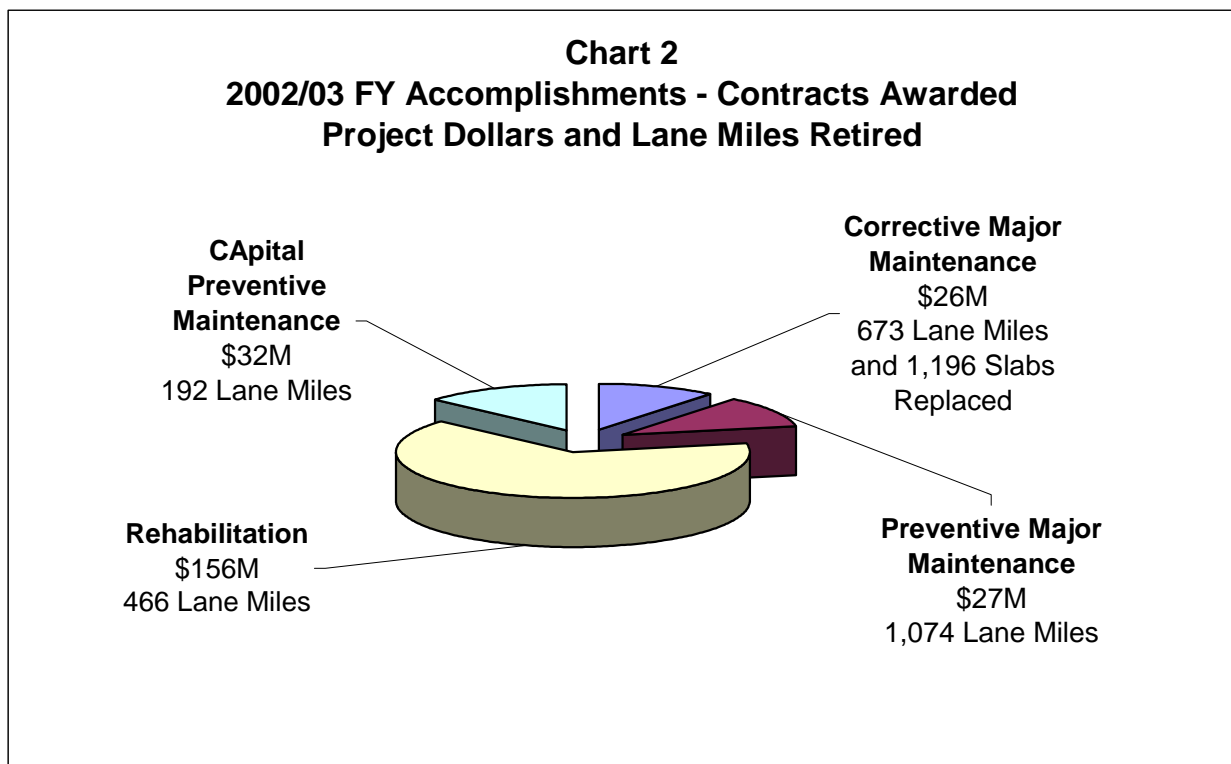
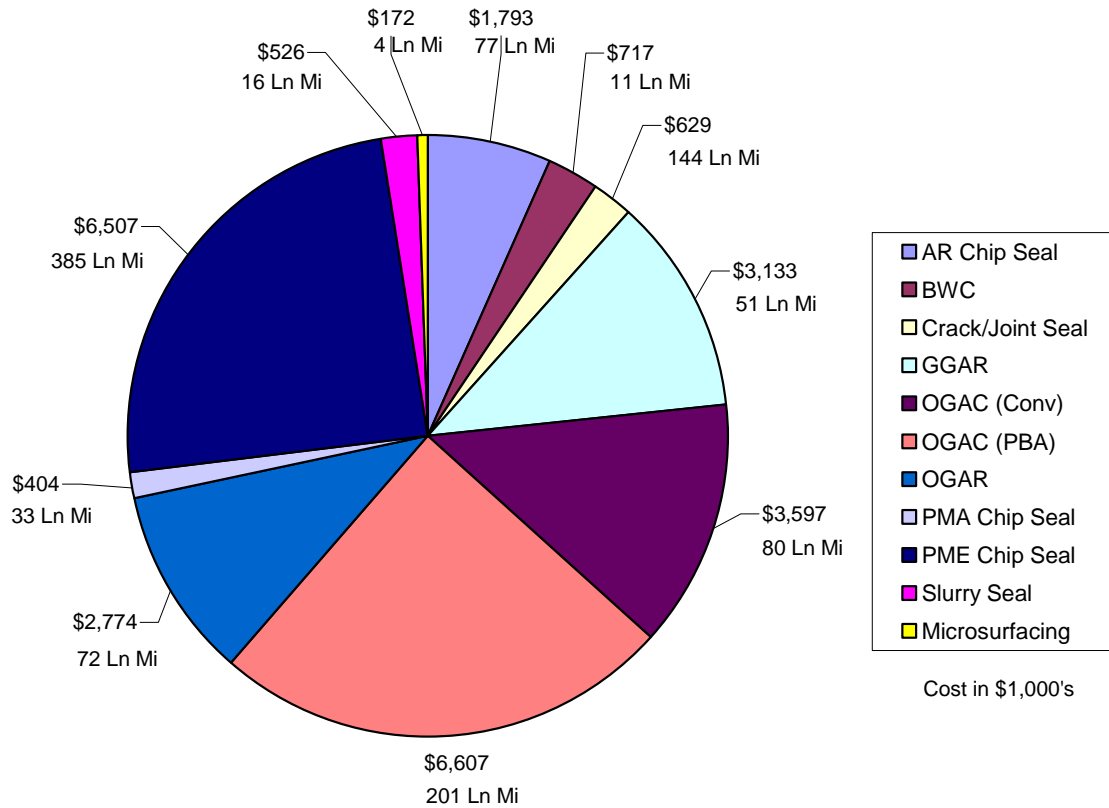


Chart 2 shows the accomplishments for Maintenance and Rehabilitation projects in terms of contract dollars awarded and lane-miles of pavement repaired in the 2002/03 FY.

Chart 3
2002/03 FY – Preventive Major Maintenance Contracts
\$26.9 Million / 1,074 Lane-Miles



A Major Maintenance contract performed on pavement in good condition is considered preventive. Chart 3 shows the cost and number of lane-miles paved using a Preventive Maintenance (PM) strategy for Major Maintenance contracts awarded in the 2002/03 FY. Preventive Maintenance strategies for flexible pavements include seal coats such as chip seals, slurry seals, and micro surfacing, as well as thin asphalt concrete overlays, and crack sealing. Similar PM treatments for concrete pavements include crack and joint sealing, spall repairs, and diamond grinding for smoothness and improved pavement texture. These treatments reduce the amount of water that may infiltrate the pavement, slow the rate of deterioration, and correct surface roughness.

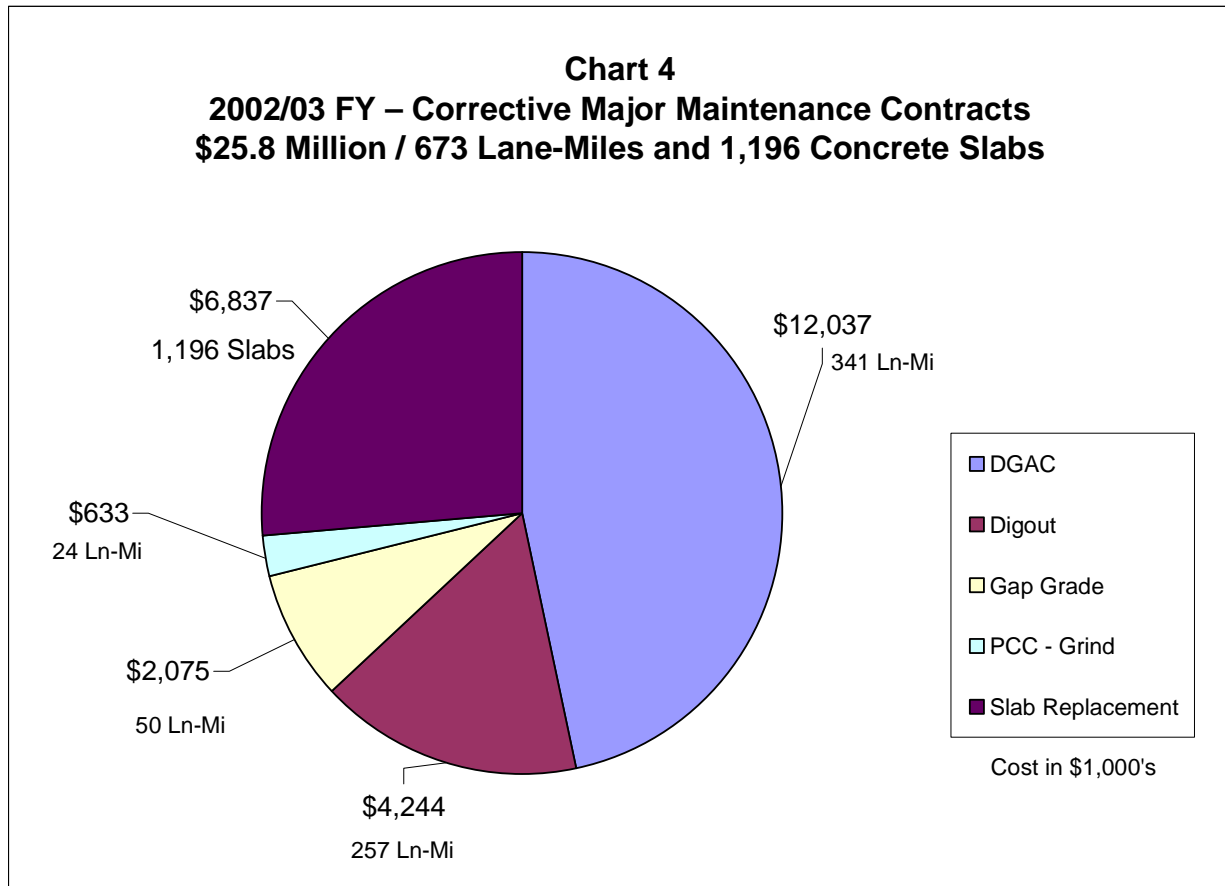


Chart 4 shows the cost and lane-miles repaired using corrective strategies in Major Maintenance and contract dollars awarded in the 2002/03 FY. Corrective Major Maintenance preserves the riding qualities, safety characteristics, and structural integrity of the roadways. Thin asphalt overlays, slab replacements and dig outs of pavement at spot locations are common strategies used for these projects.

Cost Effectiveness

Numerous studies show that pavement in good condition costs less to maintain. Five to fifteen dollars are saved for each dollar spent on a treatment applied before the pavement deteriorates into a condition warranting a major rehabilitation or reconstruction project (see Chart 5, next page).

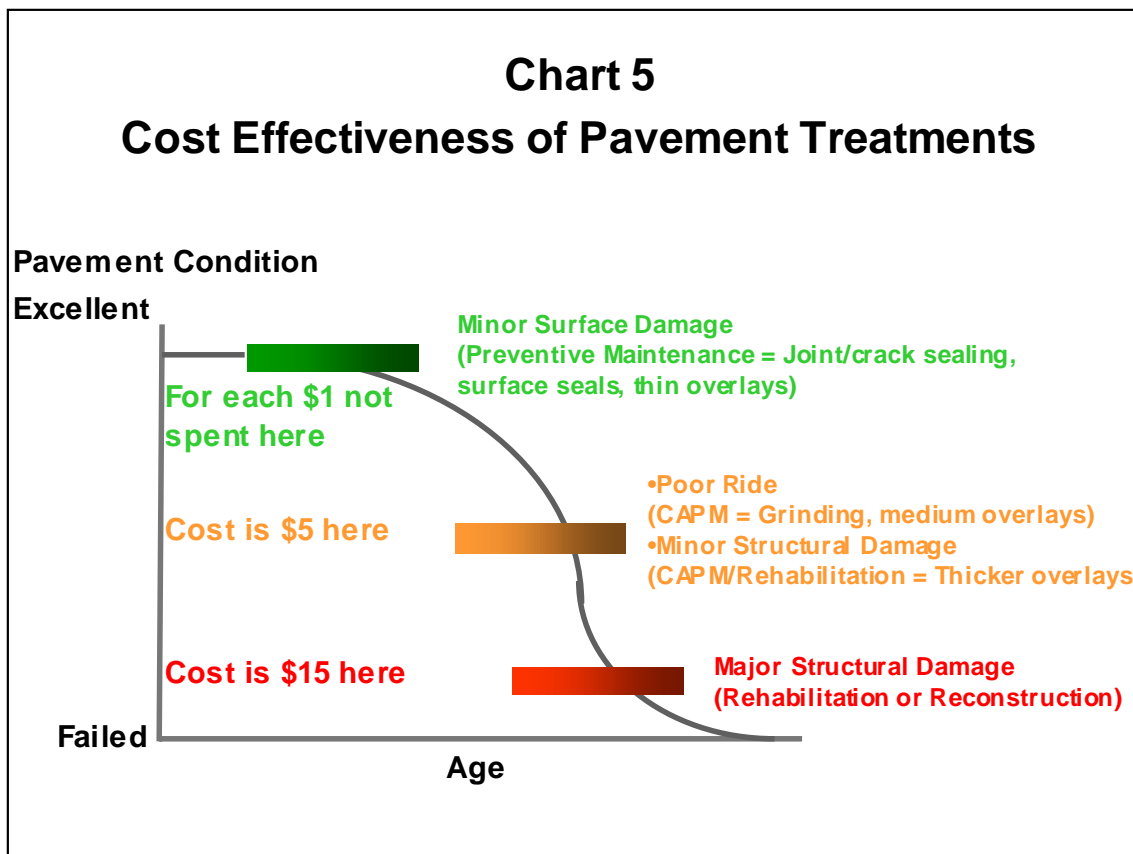
Preventive maintenance treatments keep good pavement in good shape. Timely application of PM treatments can maintain or extend a pavement's service life two to five years depending on the traffic volumes and environmental conditions. Preventive Major Maintenance project treatments cost between \$5,000 and \$35,000 per lane-mile.

Major maintenance treatments are used to correct most minor surface problems. Corrective Major Maintenance strategies can maintain or extend a pavement's service life two to five years and typically cost between \$35,000 and \$65,000 per lane-mile (see Table C, page 20).

A CAPM strategy (pavement grinding, asphalt concrete overlays greater than 1 inch, but less than 2 inches) is typically performed on pavement with minor distress. A moderate cost CAPM project can successfully restore pavement to an excellent condition and provide a service life of five to seven years. CAPM projects awarded in the 2002/03 FY varied in cost from \$145,000 to \$175,000 per lane-mile, with an average cost of \$160,000 per lane-mile.

Rehabilitation and reconstruction are the most expensive treatments. They remove and replace the pavement structural section rather than the pavement surface. A roadway that is rehabilitated should provide ten years or more of service life with relatively low maintenance expenditures. The costs for rehabilitation projects, including the upgrade of related facilities, awarded in the 2002/03 FY ranged from \$245,000 to \$980,000 per lane-mile with an average of \$370,000 per lane-mile.

Long-life pavement strategies apply to roadways showing pavement distress in the PMS and with traffic volumes greater than 150,000 average daily traffic vehicles or greater than 15,000 average daily truck vehicles. Some long-life strategies include rigid pavement reconstruction, reconstruction of concrete pavement with asphalt concrete, and crack-seal and overlay strategies that provide longer life than the current practice. Long-life pavement design extends the pavement life to more than thirty-five years and reduces traffic interruptions and delays to the traveling public due to highway construction.



Warranty Projects

The 2002/03 FY was the fourth year of the Department's one-year warranty pilot program. The five-year evaluation process of the pilot program will be completed by May 2005. The purpose of a one-year warranty is to provide protection for both materials and workmanship. Under a warranty specification, the contractor is responsible for quality control and quality assurance as quality is measured based on actual product performance. In the 2002/03 FY, six projects were awarded at a cost of \$4.4 million. Under these contracts, 153 lane-miles of pavement had a one-year warranty.

Quiet Pavements

Traffic noise is a public concern. The FHWA Noise Abatement Criteria states that when traffic noise levels meet or exceed 67 dBA, noise abatement should be provided for residential areas. Studies show that 75% of highway noise comes from vehicle tires contacting the pavement. In the past, noise barriers or soundwalls were the only solution for noise reduction. In 2003, the Department has constructed quiet pavement projects instead of soundwalls.

One quiet pavement strategy for rigid pavements is diamond grinding. For flexible pavements the strategy could be an open graded friction course. The cost of a soundwall is about \$1.3 million per mile, while diamond grinding is \$70,000 per lane-mile and a quiet pavement overlay is less than \$50,000 per lane-mile. According to the "I-80 Davis OGAC Pavement Noise Study" the noise levels for open graded friction courses can last 5 years. The 30 mm open graded friction course constructed in 1999 has maintained a 4.5 dBA noise level reduction after six years of evaluating the acoustic measurements. Currently, the Department is pursuing quiet pavement pilot projects and research that correlates IRI to acoustic measurements.

Rubberized Asphalt Concrete

During the last five years, the Department recycled over 5.8 million old tires in asphalt concrete pavements. In 2003, the Department achieved a statewide goal that 15% of the asphalt concrete pavement contracts awarded were rubberized asphalt concrete (RAC). Rubberized asphalt concrete usage can extend the pavement life and recycle old tires. Some benefits of RAC are a longer lasting pavement, a smoother ride, and some resistance to reflective cracking. In addition, RAC has the potential of significantly reducing tire noise.

During the 2002/03 FY, \$37 million was invested in Roadway Preservation RAC projects. These projects repaired over 160 lane-miles of distressed pavement. Over the same time period, \$10 million was awarded on sixteen Major Maintenance RAC projects that preserved 251 lane-miles.

Distressed Lane-Miles

The number of distressed lane-miles (those with poor structural condition or with poor ride quality) is an important indicator of the State highway system's pavement condition. This indicator is used to prioritize the road maintenance and repairs. This gauge of the pavement condition is reported in the Department's State Highway System Performance Measures. Distressed lane-miles are placed into groups as shown on Exhibit 1 (next page).

EXHIBIT 1 Pavement Condition States

Preventive Condition

Major Rehabilitation/Replacement

State 1



No Damage

State 2



**Minor Surface
Damage**

State 3



Poor Ride Only

State 4



**Minor Structural
Damage**

State 5



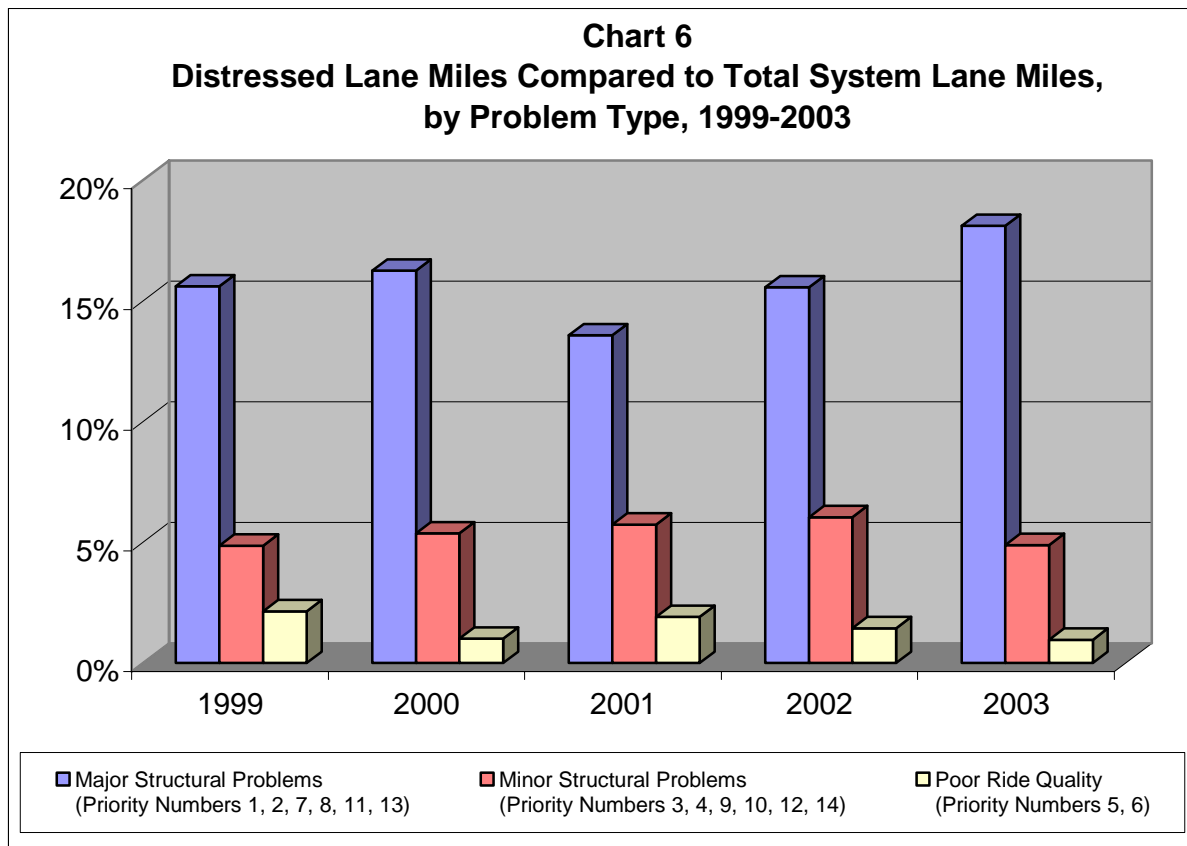
**Major Structural
Damage**

- | | |
|--|---|
| State 1: Excellent condition with no, few potholes or cracks | -- Preventive Maintenance or CAPM project |
| State 2: Good condition with minor potholes or cracks | -- Maintenance project |
| State 3: Fair condition with moderate potholes and cracks | -- CAPM project |
| State 4: Poor condition with significant cracks | -- Rehabilitation candidate |
| State 5: Poor condition with extensive cracks | -- Reconstruction candidate |

TABLE 2 Priority System, 2003

Priority Number	Structural Distress	Program Category
1, 2, 7, 8, 11 & 13	Major	Long Life or Rehabilitation
3, 4, 9, 10, 12 & 14	Minor	CAPM
5, & 6	Poor Ride Only	CAPM
15	No Distress	Major Maintenance

Priority values of 1, 2, 7, 8, 11, and 13 have major structural distress. These pavements are candidates for rehabilitation funding. Priority values 3, 4, 9, 10, 12, and 14 have minor structural distress. They are candidates for strategies funded under CAPM. Priorities 5 and 6 have no structural problems but the pavement has a poor ride. These pavements are also candidates for CAPM strategies.



A distribution of lane-miles with pavement needs by priority group for the surveys performed from 1999 through 2003 is presented in Chart 6. Although the 2003 survey shows the number of lane-miles with minor structural problems and poor ride quality decreased from the 2002 survey, there was an increase of over 1,200 lane-miles of distressed pavement with major structural problems. The percentages shown in Chart 6 are the percent of the distressed lane-miles to the total system miles (excluding bridges).

Pavement Goals Versus Ten-Year Plan for Addressing Distressed Lane-Miles

Under the Streets and Highways Code Section 164.6, the Department is required to prepare a Ten-Year State Rehabilitation Plan for rehabilitation and reconstruction of all state highways and bridges, and to set goals for each program. This plan is updated every two years. The Ten-Year Plan's statewide pavement performance goal is to reduce the total distressed lane-miles throughout the state to 5,500 by the 2015/16 FY. Each District has a goal to reach in reducing the distressed lane-miles.

TABLE 3 District Actual vs. Planned Goal for Distressed Lane Miles, 2003

District	Actual Distressed Lane-Miles per the 2003 Pavement Condition Survey	Planned Distressed Lane-Miles per the Performance Goal*
1	354	320
2	973	540
3	1,288	560
4	1,549	599
5	926	372
6	1,483	611
7	1,802	712
8	1,719	660
9	152	146
10	1,011	449
11	377	297
12	190	234
TOTAL	11,824	5,500
* from the current Ten-Year State Rehabilitation Plan		

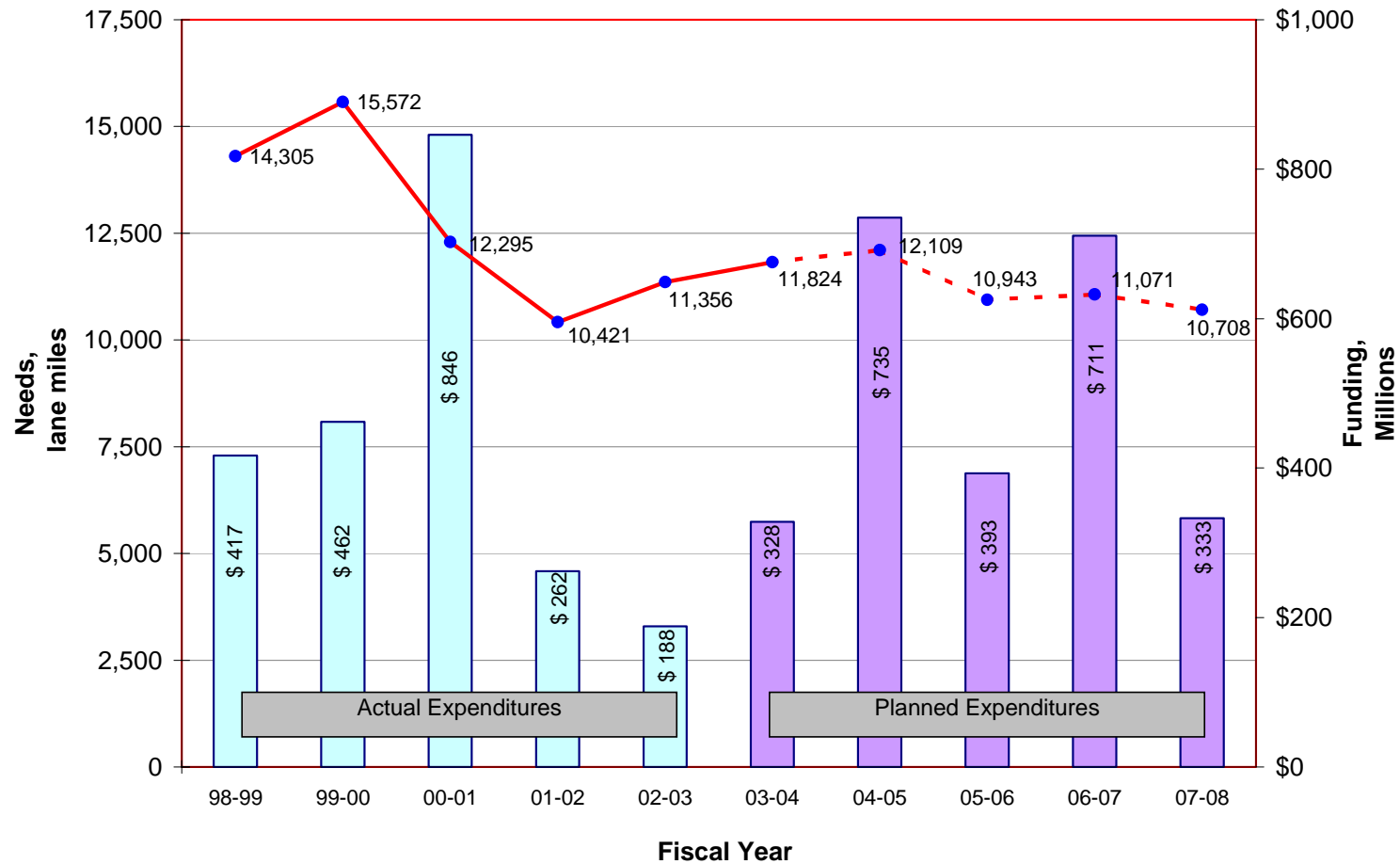
Table 3 compares the Districts' distressed lane-miles from the 2003 PCS to the Ten-Year Plan for Pavement Preservation performance goals. According to this data, three Districts are nearing their goal and only one District has met its performance goal. The other Districts are within 430 to 1,100 lane-miles from reaching their goal. To reach the statewide goal, all urban districts need to retire distressed lane-miles. However, as funds for pavement projects decrease, the Districts' distressed lane-miles will increase.

Distressed Lane-Miles and Roadway Rehabilitation Expenditures

Out of 11,824 distressed lane-miles, over 8,900 lane-miles (76%) have major structural damage. Complete roadway rehabilitation is needed to correct these deficiencies. In the past two years, the funding level for Roadway Rehabilitation projects was considerably reduced.

Chart 7 (next page) shows the relationship between expenditures awarded on Roadway Rehabilitation projects and the number of distressed lane-miles. Actual dollars awarded versus actual distressed lane-miles are shown in blue for fiscal years 1998/99 through 2002/03. In the 1999/00 FY, the state had 15,572 distressed lane-miles of pavement. With an increase of dollars awarded for rehabilitation projects, the lane-miles of distressed pavement decreased to 10,421 in the 2001/02 FY. The purple bars, from fiscal year 2003/04 to 2007/08, show the planned Roadway Rehabilitation expenditures and the expected number of distressed lane-miles.

Chart 7
Roadway Rehabilitation 2004 State Highway Operations and Protection Program
Utilization vs. Needs, through 2007/2008 FY



Solid line = Actual Distressed Lane Miles
Dashed Line = Estimated Distressed Lane Miles with Planned Expenditures

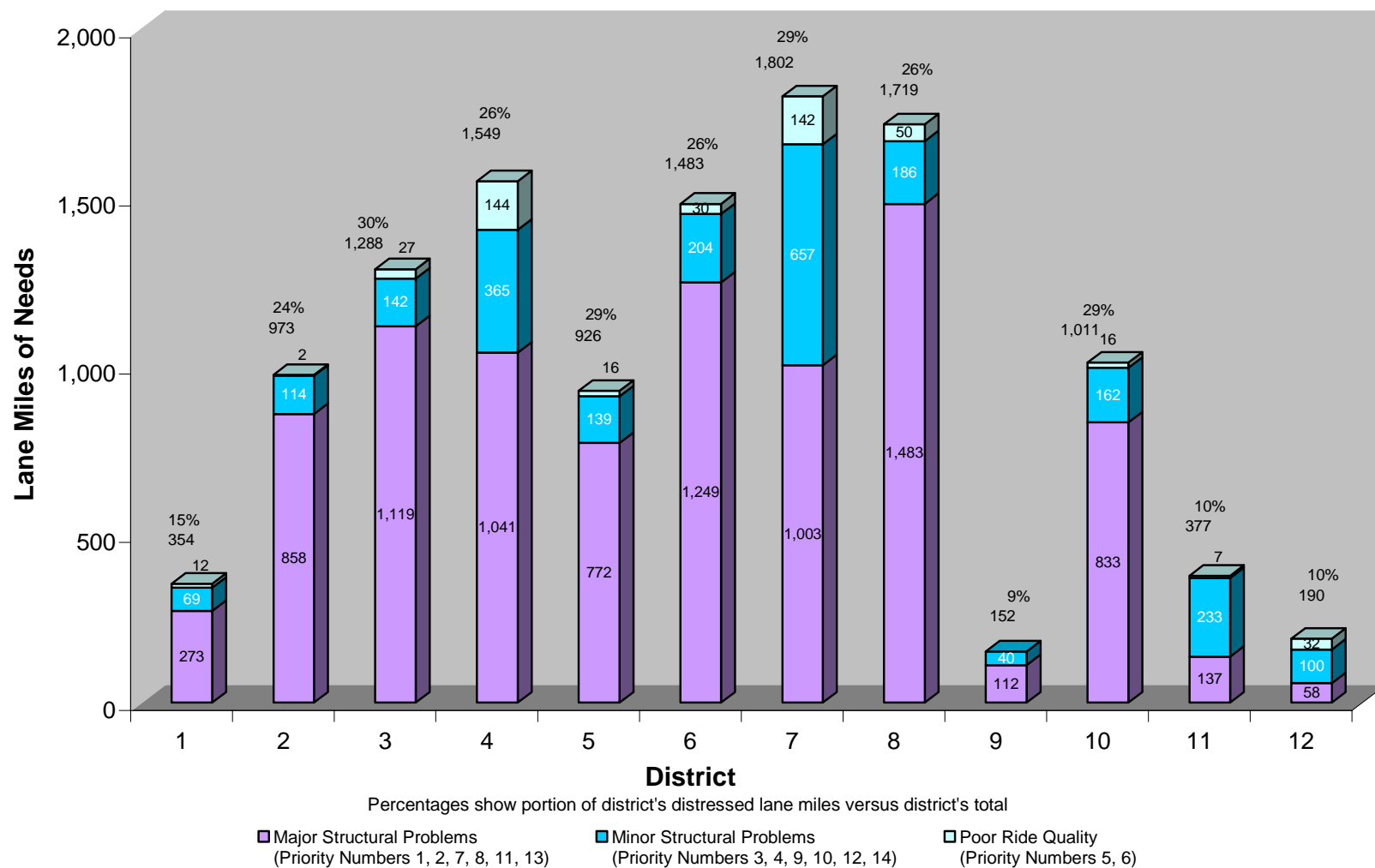
District Pavement Condition

In 2003, the total lane-miles of distressed pavement increased by 468 miles. Districts 3 (Marysville), 4 (San Francisco), 6 (Fresno), 7 (Los Angeles), 8 (San Bernardino/Riverside), and 10 (Stockton) have the greatest needs. Districts 3, 4, and 5 (San Luis Obispo) each had increases of over 100 distressed lane-miles compared to the 2002 Pavement Condition Survey.

Each year a project location priority list, generated from the PCS data is provided to the districts. From these lists, the districts develop their pavement preservation candidate lists. While the PMS suggests an initial project sequence, district knowledge of local needs and funding availability determines the project priorities for maintenance and rehabilitation projects. The field review determines the most cost-effective repair strategy.

A percentage distribution of distressed pavement, by district, from the 2003 PCS is presented in Chart 8 (next page). Total needs, as indicated at the top of the bars, are still high for Districts 4, 6, 7, and 8 with distressed pavement greater than 1,400 lane-miles each. Seven of the twelve districts have distressed pavement where major structural damage accounts for over 75% of their damaged inventory.

Chart 8
District Needs in Lane Miles, 2003 PCS



Appendix

Priority Assignment

Ride quality, surface distress, and Maintenance Service Level (MSL) are used to prioritize roadway segments. The primary criteria used to establish the overall condition of an individual segment of pavement and evaluate the need to repair highway is ride quality. Ride quality is based on pavement roughness (see Vehicle-Miles Traveled on Rough Pavements, page 2). Another criteria to assign a priority value to a roadway segment are the pavement's surface distress. Distress types are unique to each of the two pavement types: flexible (AC) pavements, or rigid (PCC) pavements. The combination of individual distresses (such as cracking, spalling, and potholes) observed on a pavement are then evaluated for severity, and broadly classified into overall levels of structural distress ('None', 'Minor', or 'Major'). The combination of ride quality data and pavement surface distress data are used to identify strategies for repairing the pavement. That information is integrated with the MSL value to establish the 'Priority Category' assigned to that pavement. Maintenance Service Level describes the role a route fulfills within the state highway network and the volume of traffic it serves.

A matrix of fourteen values results from the combination of ride quality, structural condition, and MSL. The value each pavement segment receives is used to identify the class of treatment a pavement requires, either maintenance or rehabilitation (see Table 2, page 9). In the case of two pavement segments with identical priority values, the site that will receive project development and funding depends upon factors such as safety issues, traffic volume, project costs, and ongoing maintenance expenditures as well as a detailed condition comparison.

Preventive Maintenance helps delay development of significant structural distress. In 2004, a Major Maintenance priority matrix will be implemented. The new matrix will identify pavement that has no or few defects and does not fall into the priorities for rehabilitation or CAPM strategies. Corrective or preventive maintenance will be performed on pavements based on the minor defects shown in Table 4 (next page).

Table 4 Major Maintenance Program Priority Matrix

Maintenance Type	Defect	Treatment
Corrective	Patching	Thin Blanket / Modified Binder
	Alligator A Cracks & Rutting	Thin Blanket / Modified Binder w/Leveling
	Rutting	Mill & Resurface
	Bleeding	Mill & Resurface / OGAC
	Coarse Ravel	Mill & Resurface / Resurface OGAC w/Heavy Tack Coat
	High Alligator A & B Cracks, Open Cracks	Thin Blanket / Gap Graded AR
	Shoulder Displacement	Shoulder Repair / Shoulder Joint Mill, Fill & Seal
	Slab Cracking	Slab Replacement / Lateral Stabilization
Preventive	Fine Ravel	Fog Seal
	Alligator A Cracks, No Alligator B Cracks	Chip Seal / Slurry or Overlay / Micro surfacing, Bonded Wearing Course, AC Surfacing
	No or Low Alligator A Cracks, Low Alligator B Cracks	Chip Seal / AR / Slurry or Overlay / Micro surfacing, Bonded Wearing Course, AC Surfacing
	Slab Cracking	Crack Seal
	Maintain Shoulders & Joints	Fog Seal
	Unsealed Cracks or Joints	Crack Seal

Map of Caltrans Districts

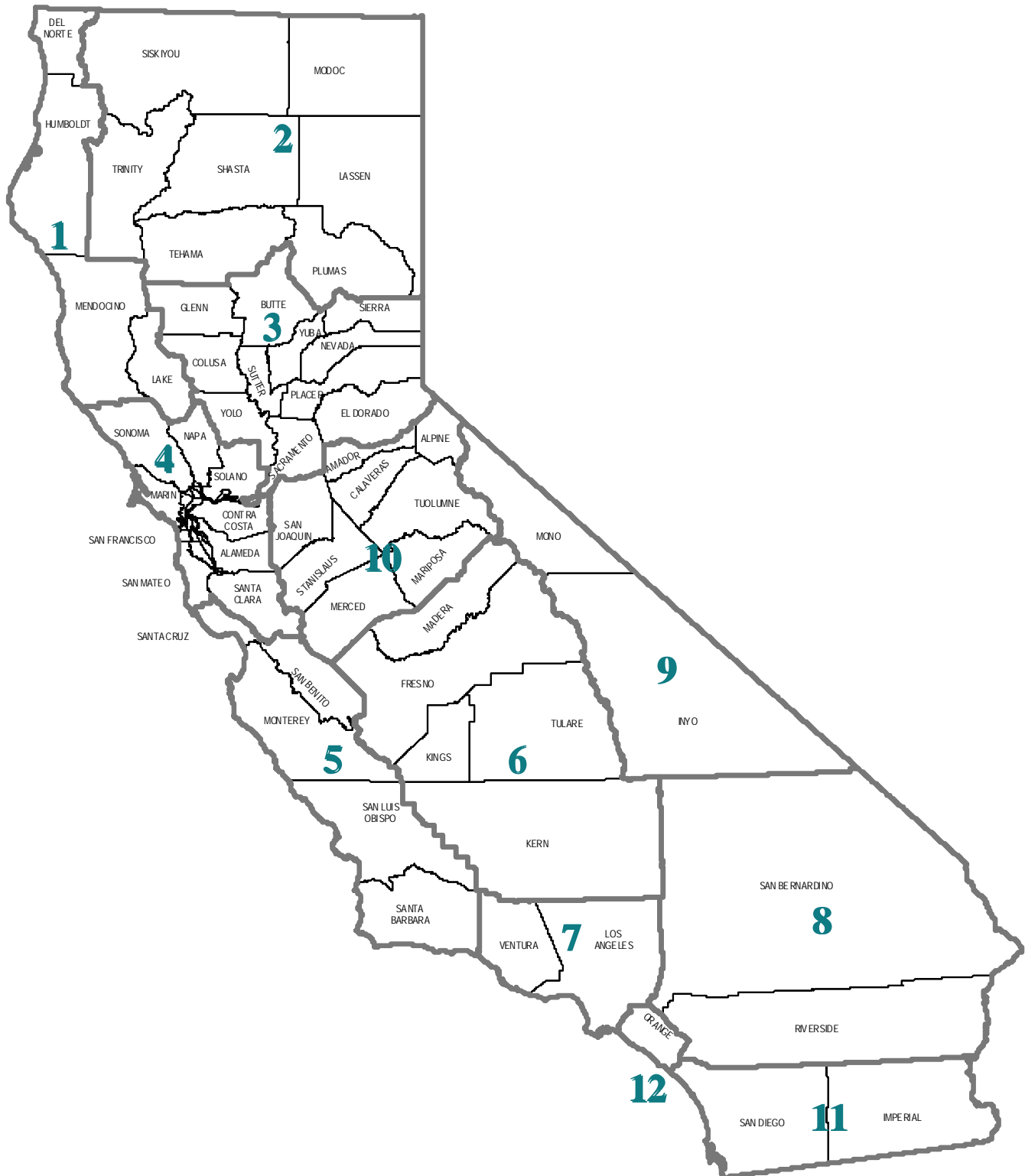


TABLE A Distribution of Centerline Miles and Lane miles, 2003

	Center line miles		Lane Miles		Distressed Lane Miles		Major Structural Deficiency	Minor Structural Deficiency	Poor Ride Quality
TOTAL	14,911	100%	49,318	100%	11,824	24%	8,938	2,410	476
PRIORITY									
Major Structural Deficiencies					8,938	18%			
Minor Structural Deficiencies					2,410	5%			
Poor Ride Quality					476	1%			
NONE (Not Distressed)					37,496	76%			
					49,320	100%			
MSL									
1	5,972	40%	27,574	56%	5,641	48%			
2	5,375	36%	14,426	29%	4,076	34%			
3	3,545	24%	7,213	15%	2,105	18%			
	14,892	100%	49,214	100%	11,822	100%			
DISTRICT									
1	927	6%	2,330	5%	354	3%	272.66	69.09	11.98
2	1,719	12%	3,995	8%	973	8%	858.19	113.64	1.57
3	1,462	10%	4,285	9%	1,288	11%	1,119.10	141.56	27.19
4	1,368	9%	5,958	12%	1,549	13%	1,040.98	364.86	143.54
5	1,149	8%	3,187	6%	926	8%	771.56	138.91	15.99
6	2,026	14%	5,751	12%	1,483	13%	1,248.54	203.94	30.09
7	1,084	7%	6,158	12%	1,802	15%	1,003.26	657.14	141.51
8	1,884	13%	6,575	13%	1,719	15%	1,482.64	185.66	50.25
9	739	5%	1,777	4%	152	1%	111.79	40.18	0.00
10	1,304	9%	3,471	7%	1,011	9%	833.11	162.22	15.90
11	973	7%	3,927	8%	377	3%	137.42	232.85	6.53
12	279	2%	1,904	4%	190	2%	58.41	99.77	31.88
	14,911	100%	49,318	100%	11,824	100%	8,938	2,410	476
ROAD TYPE									
Multi-Lane Divided	5,590	37%	30,049	61%	6,090	52%			
Multi-Lane Undivided	394	3%	1,357	3%	429	4%			
Two-Lane	8,926	60%	17,911	36%	5,302	45%			
	14,911	100%	49,318	100%	11,822	100%			
CITY									
City	2,774	19%	16,008	32%	3,725	32%			
Non-city	12,136	81%	33,309	68%	8,097	68%			
	14,911	100%	49,318	100%	11,822	100%			
NATIONAL HIGHWAY SYSTEM									
NHS Interstate	2,223	15%	13,292	27%	2,541	21%			
NHS non-Interstate	4,813	32%	17,405	35%	3,945	33%			
Non-NHS roads	7,875	53%	18,621	38%	5,338	45%			
	14,911	100%	49,318	100%	11,824	100%			
INTERMODAL CORRIDORS OF ECONOMIC SIGNIFICANCE (ICES)									
ICES	3,317	22%	17,854	36%	3,575	30%			
Non-ICES roads	11,594	78%	31,464	64%	8,249	70%			
	14,911	100%	49,318	100%	11,824	100%			
PAVEMENT TYPE									
Flexible	12,206	82%	33,028	67%	8,595	73%			
Rigid	2,706	18%	16,299	32%	3,229	27%			
	14,912	100%	49,327	99%	11,824	100%			

	Priority Numbers
Major Structural Deficiencies	1, 2, 7, 8, 11, 13
Minor Structural Deficiencies	3, 4, 9, 10, 12, 14
Poor Ride Quality	5, 6

(Excludes Bridges)

TABLE B

Distressed Lane Miles by Priority Group

District	1999			2000			2001			2002			2003		
	Major Structural Problems	Minor Structural Problems	Poor Ride Quality	Major Structural Problems	Minor Structural Problems	Poor Ride Quality	Major Structural Problems	Minor Structural Problems	Poor Ride Quality	Major Structural Problems	Minor Structural Problems	Poor Ride Quality	Major Structural Problems	Minor Structural Problems	Poor Ride Quality
1	303	110	71	179	96	18	199	84	33	243	95	20	273	69	12
2	875	188	31	587	102	1	752	125	22	709	171	15	858	114	2
3	1,112	318	99	832	308	40	544	204	56	842	220	46	1,119	142	27
4	1,438	570	320	1,500	531	81	809	492	158	879	450	121	1,041	365	144
5	935	175	80	625	114	11	513	151	24	621	156	32	772	139	16
6	1,980	350	186	1,008	281	2	1,093	292	123	1,093	312	40	1,249	204	30
7	1,063	487	474	1,182	616	653	909	620	238	815	724	254	1,003	657	142
8	1,290	493	136	1,449	324	42	1,095	319	99	1,441	256	70	1,483	186	50
9	205	93	0	73	45	0	119	58	0	130	62	0	112	40	0
10	1,144	189	39	638	152	11	477	128	32	735	203	19	833	162	16
11	119	197	126	146	255	3	122	167	57	107	218	9	137	233	7
12	139	170	67	111	189	91	36	177	92	54	109	87	58	100	32
Totals	10,603	3,340	1,629	8,330	3,013	952	6,668	2,818	935	7,669	2,976	710	8,938	2,410	476

District Lane Miles by Pavement Condition Survey Year

District	1999			2000			2001			2002			2003		
	System Lane Miles	Distressed Ln Miles	Pct. of System	System Lane Miles	Distressed Ln Miles	Pct. of System	System Lane Miles	Distressed Ln Miles	Pct. of System	System Lane Miles	Distressed Ln Miles	Pct. of System	System Lane Miles	Distressed Ln Miles	Pct. of System
1	2,334	484	21%	2,329	293	13%	2,330	316	14%	2,330	358	15%	2,330	354	15%
2	4,001	1,094	27%	3,992	689	17%	3,992	899	23%	3,992	894	22%	3,995	973	24%
3	4,311	1,529	35%	4,305	1,180	27%	4,284	804	19%	4,284	1,108	26%	4,285	1,288	30%
4	5,917	2,329	39%	5,916	2,112	36%	5,957	1,459	24%	5,958	1,450	24%	5,958	1,549	26%
5	3,197	1,190	37%	3,194	750	23%	3,187	688	22%	3,187	809	25%	3,187	926	29%
6	5,691	2,517	44%	5,678	1,292	23%	5,734	1,508	26%	5,751	1,446	25%	5,751	1,483	26%
7	6,147	2,024	33%	6,156	2,450	40%	6,106	1,767	29%	6,106	1,792	29%	6,158	1,802	29%
8	6,464	1,918	30%	6,462	1,815	28%	6,492	1,512	23%	6,575	1,767	27%	6,575	1,719	26%
9	1,758	298	17%	1,754	118	7%	1,777	178	10%	1,777	192	11%	1,777	152	9%
10	3,474	1,371	39%	3,469	801	23%	3,452	637	18%	3,462	957	28%	3,471	1,011	29%
11	3,904	442	11%	3,899	405	10%	3,909	347	9%	3,923	334	9%	3,927	377	10%
12	1,686	376	22%	1,683	390	23%	1,888	305	16%	1,904	249	13%	1,904	190	10%
Totals	48,883	15,572	32%	48,837	12,295	25%	49,108	10,421	21%	49,249	11,356	23%	49,318	11,824	24%

Statewide Pavement Needs by Survey Year and Priority Group

Priority	1999			2000			2001			2002			2003		
	Distressed Ln Miles	Pct. Of Needs	Pct. of System	Distressed Ln Miles	Pct. Of Needs	Pct. of System	Distressed Ln Miles	Pct. Of Needs	Pct. of System	Distressed Ln Miles	Pct. Of Needs	Pct. of System	Distressed Ln Miles	Pct. Of Needs	Pct. of System
Major	10,603	68%	22%	8,330	68%	17%	6,668	64%	14%	7,669	68%	16%	8,938	76%	18%
Minor	3,340	21%	7%	3,013	25%	6%	2,818	27%	6%	2,976	26%	6%	2,410	20%	5%
Poor	1,629	0	3%	952	0	2%	935	0	2%	710	0	1%	476	0	1%
Total	15,572	100%	32%	12,295	100%	25%	10,421	100%	21%	11,356	100%	23%	11,824	100%	24%

	Priority Numbers
Major Structural Problems	1, 2, 7, 8, 11, 13
Minor Structural Problems	3, 4, 9, 10, 12, 14
Poor Ride Quality	5, 6

Notes:

Source: 1999-2003 Pavement Condition Surveys, Pavement Management System.

Caltrans, Division of Maintenance, Office of Roadway Rehabilitation, Pavement Management Information Branch.

TABLE C Maintenance and Rehabilitation Cost and Usage, 1999-2003

Maintenance, Contracted	Average	98/99	99/00	00/01	01/02	02/03
Cost per Lane Mile, by Fiscal Year						
CHIP SEAL (AR)	\$ 25,480	N/A	\$ 18,488	\$ 29,864	\$ 30,403	\$ 23,165
CHIP SEAL (PMA)	\$ 17,630	N/A	\$ 19,155	\$ 13,800	\$ 25,179	\$ 12,385
CHIP SEAL (PME)	\$ 12,970	\$ 5,132	\$ 14,784	\$ 12,456	\$ 15,547	\$ 16,908
CRACK SEAL	\$ 4,700	\$ 1,799	\$ 8,717	\$ 7,308	\$ 1,310	\$ 4,381
* MICROSURFACING	\$ 35,230	N/A	N/A	\$ 21,573	\$ 44,147	\$ 39,966
* THIN BONDED WEARING COURSE	\$ 69,530	N/A	N/A	N/A	\$ 72,697	\$ 66,360
OPEN GRADE AC	\$ 32,970	\$ 23,570	\$ 33,142	\$ 33,260	\$ 38,550	\$ 36,333
RUBBERIZED AC SURFACING	\$ 44,930	\$ 32,266	\$ 45,069	\$ 42,852	\$ 58,440	\$ 46,029
SLURRY SEAL	\$ 19,790	\$ 18,945	\$ 14,711	\$ 16,032	\$ 16,367	\$ 32,894
THIN BLANKET	\$ 31,830	\$ 24,751	\$ 32,504	\$ 37,241	\$ 29,424	\$ 35,225
DIGOUT	\$ 30,870	N/A	N/A	N/A	\$ 45,230	\$ 16,510
PCC GRIND	\$ 26,360	N/A	N/A	N/A	N/A	\$ 26,363
** PCC SLAB EACH	\$ 4,070	\$ 3,517	\$ 3,393	\$ 3,352	\$ 4,377	\$ 5,717
Lane Miles Treated, by Fiscal Year						
CHIP SEAL (AR)	176	N/A	320	245	63	77
CHIP SEAL (PMA)	105	N/A	146	158	84	33
CHIP SEAL (PME)	813	1,326	880	1,047	426	385
CRACK SEAL	251	488	115	322	185	144
* MICROSURFACING	59	N/A	N/A	142	31	4
* THIN BONDED WEARING COURSE	51	N/A	N/A	N/A	92	11
OPEN GRADE AC	442	168	1,006	538	217	281
RUBBERIZED AC SURFACING	94	112	137	25	25	173
SLURRY SEAL	116	14	204	122	226	16
THIN BLANKET	788	1,015	479	1,251	853	342
DIGOUT	142	N/A	N/A	N/A	26	257
PCC GRIND	24	N/A	N/A	N/A	N/A	24
** PCC SLAB EACH	1,424	934	1,895	2,374	722	1,196
TOTAL, CONTRACT MTCE. LANE MILES	2,847	3,123	3,287	3,850	2,228	1,747
Rehabilitation, Contracted	Average	98/99	99/00	00/01	01/02	02/03
Cost per Lane Mile, by Fiscal Year						
ACOL FLEX, CAPM	\$ 113,300	\$ 116,937	\$ 86,540	\$ 128,468	\$ 109,431	\$ 125,112
ACOL RIGID, CAPM	\$ 126,710	\$ 172,378	N/A	\$ 81,042	N/A	N/A
*** CPR, CAPM	\$ 71,120	N/A	\$ 71,118	N/A	N/A	N/A
GRINDING, CAPM	\$ 86,340	\$ 55,609	\$ 48,754	\$ 79,551	\$ 161,434	N/A
RUBBERIZED AC, CAPM	\$ 99,090	\$ 76,032	\$ 59,778	\$ 115,376	N/A	\$ 145,178
ACOL FLEX, REHABILITATION	\$ 233,770	\$ 196,359	\$ 251,344	\$ 271,009	\$ 324,775	\$ 125,349
ACOL RIGID, REHABILITATION	\$ 348,490	N/A	\$ 198,570	\$ 568,194	\$ 278,715	N/A
*** CPR, REHABILITATION	\$ 307,500	N/A	\$ 163,172	N/A	\$ 451,835	N/A
GRINDING, REHABILITATION	\$ 150,460	N/A	\$ 89,613	N/A	\$ 211,306	N/A
MILL AND REPLACE AC	\$ 186,450	\$ 150,264	\$ 214,847	\$ 98,103	\$ 221,692	\$ 247,364
RUBBERIZED AC, REHABILITATION	\$ 176,590	N/A	\$ 131,707	\$ 176,176	\$ 118,139	\$ 280,329
PCC OVERLAY	\$ 918,460	\$ 857,200	N/A	N/A	N/A	\$ 979,710
Lane Miles Treated, by Fiscal Year						
ACOL FLEX, CAPM	481	798	730	529	218	130
ACOL RIGID, CAPM	137	172	N/A	102	N/A	N/A
*** CPR, CAPM	432	N/A	863	N/A	2	N/A
GRINDING, CAPM	301	102	244	795	64	N/A
RUBBERIZED AC, CAPM	526	134	401	1,506	N/A	62
ACOL FLEX, REHABILITATION	585	838	769	756	378	185
ACOL RIGID, REHABILITATION	222	N/A	179	307	179	N/A
*** CPR, REHABILITATION	87	N/A	159	N/A	16	N/A
GRINDING, REHABILITATION	149	N/A	119	N/A	178	N/A
MILL AND REPLACE AC	180	322	132	267	20	162
RUBBERIZED AC, REHABILITATION	77	N/A	61	113	36	99
PCC OVERLAY	12	3	N/A	N/A	N/A	21
Subtotal, CAPM	1,877	1,205	2,238	2,931	283	192
Subtotal, REHABILITATION	1,312	1,163	1,419	1,442	807	467
TOTAL CAPM/REHAB LANE MILES	3,189	2,368	3,657	4,373	1,090	659
TOTAL, ALL CONTRACT LANE MILES	5,994	5,491	6,944	8,223	3,318	2,406

N/A - NOT AVAILABLE OR STRATEGY NOT UTILIZED

* PILOT PROJECTS

** PCC SLABS ARE ACTUAL COUNT OF SLABS OR COST PER SLAB

*** CPR INCLUDES SLAB REPLACEMENTS (REHAB/CAPM); GRIND, SLAB REPLACE, ROUT AND SEAL CRACKS (REHAB & CAPM); DOWEL BAR RETROFIT

Definitions/Glossary

AADT – Annual Average Daily Traffic – Average daily traffic over an entire year, estimated from a traffic sample collected over a one to seven day time period.

AC – Asphalt Concrete – Consisting of sand, gravel, and a petroleum binder; also called ‘bituminous’, ‘flexible’ or ‘black’ pavement.

ACOL – Asphalt Concrete Overlay – Placing layers of asphalt and inner membranes over an existing roadway. Typically, 6 inches of asphalt are added.

Alligator (Fatigue) cracking – Cracks in asphalt that are caused by repeated traffic loadings. The cracks indicate fatigue failure of the asphalt layer. When cracking is characterized by interconnected cracks, the cracking pattern resembles that of an alligator’s skin.

Alligator A – A single or two parallel longitudinal cracks in the wheel path; cracks are not spalled or sealed; rutting or pumping is not evident.

Alligator B – An area of interconnected cracks in the wheel path forming a complete pattern; cracks may be slightly spalled; cracks may be sealed; rutting or pumping may exist.

Alligator C – An area of moderately or severely spalled interconnected cracks outside of the wheel path forming a complete pattern; cracks may be sealed.

AR – Asphalt Rubber – A mixture of asphalt concrete containing rubber ‘crumbs’ and synthetic binders.

BWC – Bonded Wearing Course, also known as a Thin Bonded Wearing Course (Nova Chip), is a polymer-modified emulsion typically used as a pavement preservation treatment.

CAPM – Capital Preventive Maintenance – Use of heavy maintenance treatments such as intermediate thickness asphalt blankets (flexible pavements), or grinding the pavement surface (rigid pavements) to provide five to seven years of additional pavement life.

Centerline mile – A mile of highway, without considering the number of lanes in the facility.

Chip Seal – A surface treatment in which the pavement is sprayed with asphalt (generally emulsified) and then immediately covered with aggregate and rolled with a pneumatic tire roller.

Corrective Maintenance – A planned treatment that is intended to temporarily correct a specific pavement distress or delay future need to rehabilitate the pavement.

Definitions/Glossary (Continued)

CPR – Concrete Pavement Restoration – May involve surface grinding, slab replacements, or full lane replacement.

Crack, seat, and overlay – The existing pavement is cracked into small pieces that are rolled (seated) into the existing roadbed and overlaid with asphalt.

Grinding – Removing the irregularities in the surface of a pavement to improve ride quality, typically on rigid pavement.

Faulting – Slabs of Portland Cement Concrete (PCC) that are tilted, causing a drop off of the departure end of one slab onto the leading edge of the next slab.

Flexible pavement – Pavement constructed from asphalt concrete, also known as ‘bituminous’ or ‘black’ pavement.

HA22 – The highway program that funds long-term corrective strategies such as reconstruction or rehabilitation of pavements (currently known as 201.120 and 201.125). HA22 program projects are an element of the four-year SHOPP.

HM1 – The highway program that funds Routine and Major Maintenance on the State highway network. HM1 programs are funded from Caltrans’ annual operating budget.

ICES – Intermodal Corridors of Economic Significance – The ICES is California's primary goods movement system. ICES is an interconnected network of freight distribution routes within California that provides direct access among major highways, seaports, airports, rail yards and national and international markets.

IRI – International Roughness Index – A standardized method of measuring the roughness of the pavement surface, expressed in inches per mile or centimeters per kilometer, developed by the World Bank.

Lane-mile – A pavement measuring one mile long and one lane wide. A mile stretch of a two-lane road equals two lane-miles. A segment of road one mile long and four lanes wide is four lane-miles. This is the unit of measure used to develop the total cost of pavement projects.

Long-life pavement – A pavement intended to last thirty-five years or more between rehabilitation treatments.

Maintenance – Work, either by contract or by State forces that preserves the riding qualities, safety characteristics, functional serviceability and structural integrity of the facilities that comprise the roadways on the State highway system.

Definitions/Glossary (Continued)

Maintenance Program – The program, within the California Department of Transportation, that is responsible for the preservation and keeping of rights of way, and each type of roadway, structure, safety convenience or device, planting, illumination equipment, and other facilities, in the safe and usable condition to which it has been improved or constructed.

MSL – Maintenance Service Level – For maintenance programming purposes, the State highway system has been classified as Class 1, 2, and 3 highways based on the MSL descriptive definitions:

MSL 1 – Contains route segments in urban areas functionally classified as Interstate, Other Freeway/Expressway, or Other Principal Arterial. In rural areas, the MSL 1 designation contains route segments functionally classified as Interstate or Other Principal Arterial.

MSL 2 – Contains route segments classified as an Other Freeway/Expressway, or Other Principal Arterial not in MSL 1, and route segments functionally classified as minor arterials not in MSL 3.

MSL 3 – Indicates a route or route segment with the lowest maintenance priority. Typically, MSL 3 contains route segments functionally classified as major or minor collectors and local roads, routes segments with relatively low traffic volumes. Route segments where route continuity is necessary are also assigned MSL 3 designation.

Major Maintenance – Use of various types of surface treatments, such as thin blankets and chips seals, to extend the service life of a pavement, usually by three to five years. These treatments keep the roadway in a safe, useable condition but do not include structural capacity improvement or reconstruction.

NHS – National Highway System – Includes the Interstate Highway System as well as other roads important to the nation's economy, defense, and mobility. The NHS was developed by the U.S. Department of Transportation in cooperation with the states, local officials, and metropolitan planning organizations.

OGAC – Open Graded Asphalt Concrete or Open Graded Blanket – A surface layer of asphalt approximately 1 inch thick, containing few fine particles between the larger pieces of aggregate. This allows water to enter the voids and drain out through the edges of the pavement, reducing standing water on the pavement, and improving skid resistance in wet weather.

PCC – Portland Cement Concrete – 'Rigid' pavement.

PCS – Pavement Condition Survey – An annual survey of the State highway system conducted by the California Department of Transportation.

Definitions/Glossary (Continued)

PMA – Polymer Modified Asphalt – A binder used in a seal coat or dense and open-graded AC.

PME – Polymer Modified Emulsion – A binder used in a seal coat or as a tack coat for construction.

Preventive Maintenance – A planned treatment on a road in good condition that is intended to preserve the system, retard future deterioration and prolong the service life.

RAC – Rubberized asphalt concrete – Material produced for hot mix applications by mixing asphalt rubber or rubberized asphalt binder with graded aggregate. RAC may be dense-, gap-, or open-graded.

Raveling – Wearing away of the pavement surface caused by the dislodging of aggregate particles and loss of binder through weathering and aging.

Rigid pavement – Pavement constructed from Portland Cement Concrete (PCC).

Roadway Preservation – The keeping of the roadway and appurtenant facilities in the safe and usable condition to which it has been improved or constructed.

Roadway Preservation Program – The program, within the California Department of Transportation, that is responsible for preserving the State highway network.

Roadway Rehabilitation – A treatment on roadways that ride rougher than established maximums and/or exhibit substantial structural distress, usually extending the service life of a pavement by ten to fifteen years. Grinds/cold planes, slab replacements, dig outs, and overlays are the strategies usually used in Roadway Rehabilitation.

Roadway Rehabilitation Program – The program, within the California Department of Transportation, that is responsible to rehabilitate roadways that ride rougher than established maximums and/or exhibit substantial structural distress. Work incidental to pavement rehabilitation or replacement of other highway appurtenances that are failing, worn out or functionally obsolete, such as drainage facilities, retaining walls, lighting, signal controllers, and fencing.

Routine maintenance – Low-level maintenance treatments, such as crack sealing, joint sealing, and minor patching.

Seal coat – A sealant applied uniformly to the entire pavement surface, usually with embedded sand or gravel ‘chips’, primarily to prevent water infiltration, improve traction, and renew the pavement surface.

Definitions/Glossary (Continued)

Slab – A unit of Portland Cement Concrete (PCC) pavement defined by surrounding expansion joints.

Slurry seal – A petroleum-based emulsion seal coat (with embedded fine aggregates) applied to the pavement surface.

Spalling – Spalling occurs at joints or cracks when incompressible materials are confined in the opening. It also occurs where uniform slab support is lacking and there is vertical movement due to wheel load impact. Spalling results in progressive widening of the joint or cracks, and ultimately deterioration of aggregate interlock at the joint.

State highway network – The entire system of highways maintained by the California Department of Transportation. For pavement management purposes, excludes bridge decks and ramps.

State Highway System Performance Measures – A periodic report prepared by the California Department of Transportation to track a variety of performance and accountability measures for routine review by Department management and others.